WHAT IS CLAIMED IS:

1. A grating-coupled waveguide comprising:
a substrate;
a diffraction grating; and
a waveguide film that has a higher index of refraction than said substrate which has an index of refraction ≤ 1.5.

2. The grating-coupled waveguide of Claim 1, wherein said diffraction grating is formed within a top surface of said waveguide film.

3. The grating-coupled waveguide of Claim 1, wherein said diffraction grating is formed within said waveguide film.

4. The grating-coupled waveguide of Claim 1, wherein said diffraction grating also serves the function of said waveguide film.

5. The grating-coupled waveguide of Claim 1, wherein said diffraction grating is formed within a top surface of said substrate.

6. The grating-coupled waveguide of Claim 1, wherein said substrate has an index of refraction in the range of about 1.4-1.5.

7. The optical waveguide of Claim 6, wherein said substrate is a thermoplastic material including polyvinylidene fluoride, polymethylpentene and blends of polyvinylidene fluoride/polymethylmethacrylate.

8. The optical waveguide of Claim 1, wherein said substrate has an index of refraction ≤ 1.4.

9. The optical waveguide of Claim 8, wherein said substrate is a fluoropolymer including fluoroacrylate.

10. A grating-coupled waveguide comprising:

a substrate;

a diffraction grating;

a waveguide film formed above said substrate, wherein said waveguide film has a higher index of refraction than said substrate which has an index of refraction ≤ 1.5;

wherein said diffraction grating is either fabricated directly into said substrate or said waveguide film, or located in optical proximity to the said waveguide film, or even forming said waveguide film itself; and

wherein said substrate has a bottom surface that receives a light beam which interfaces with a waveguide formed by said diffraction grating and said waveguide film and diffracts into a fundamental mode which has an evanescent tail that extends further into a sensing region above said waveguide film than in prior art because said substrate has an index of refraction ≤ 1.5.

11. The grating-coupled waveguide of Claim 10, wherein a surface sensitivity in the sensing region above said waveguide film is enhanced because said substrate has an index of refraction ≤ 1.5.

12. The grating-coupled waveguide of Claim 10, wherein a bulk sensitivity in the sensing region above said waveguide film is enhanced because said substrate has an index of refraction ≤ 1.5.

13. The grating-coupled waveguide of Claim 10, wherein said substrate has an index of refraction in the range of about 1.4-1.5.

14. The optical waveguide of Claim 13, wherein said substrate is a thermoplastic material including polyvinylidene fluoride, polymethylpentene and blends of polyvinylidene fluoride/polymethylmethacrylate.

15. The optical waveguide of Claim 10, wherein said substrate has an index of refraction ≤ 1.4.

16. The optical waveguide of Claim 15, wherein said substrate is a fluoropolymer including fluoroacrylate.

17. A method for interrogating one or more grating-based waveguide sensors, said method comprising the steps of:

directing a light beam into each grating-based waveguide sensor, wherein each grating-based waveguide sensor includes;

a substrate;

a diffraction grating; and

a waveguide film that has a higher index of refraction than said substrate which has an index of refraction ≤ 1.5, wherein said substrate has a bottom surface that receives the light beam which interfaces with a waveguide formed by said diffraction grating and said waveguide film and diffracts into a fundamental mode which has an evanescent tail that extends further into a sensing region above said waveguide film than in prior art because said substrate has an index of refraction ≤ 1.5;

receiving a reflected light beam from each grating-based waveguide sensor; and

analyzing each received reflected light beam to detect a resonant condition which corresponds to a predetermined refractive index that indicates whether a biological substance is present in the sensing region above said waveguide film of the respective grating-based waveguide sensor.

18. The method of Claim 17, wherein said substrate has an index of refraction in the range of about 1.4-1.5.

19. The method of Claim 18, wherein said substrate is a thermoplastic material including polyvinylidene fluoride, polymethylpentene and blends of polyvinylidene fluoride/polymethylmethacrylate.

20. The method of Claim 17, wherein said substrate has an index of refraction ≤ 1.4.

21. The method of Claim 20, wherein said substrate is a fluoropolymer including fluoroacrylate.

22. The method of Claim 17, wherein said grating-based waveguides are located in wells formed within a microplate.

23. A microplate comprising:

a frame including a plurality of wells formed therein, each well incorporating a grating-based waveguide that includes:

a substrate;

a diffraction grating; and

a waveguide film that has a higher index of refraction than said substrate which has an index of refraction ≤ 1.5.

24. The microplate of Claim 23, wherein said substrate has an index of refraction in the range of about 1.4-1.5.

25. The microplate of Claim 24, wherein said substrate is a thermoplastic material including polyvinylidene fluoride, polymethylpentene and blends of polyvinylidene fluoride/polymethylmethacrylate.

26. The microplate of Claim 23, wherein said substrate has an index of refraction ≤ 1.4.

27. The microplate of Claim 26, wherein said substrate is a fluoropolymer including fluoroacrylate.

28. The microplate of Claim 23, wherein said grating-based waveguides are formed within the wells in accordance with the following steps:

dipping a dispensing tool into a low index ultraviolet curable material;

transferring a portion of the low index ultraviolet curable material from the dispensing tool to a grating tool which forms diffraction gratings within the low index ultraviolet curable material;

transferring the low index ultraviolet curable material from the grating tool into the wells;

exposing the low index ultraviolet curable material within the wells to ultraviolet light to form the substrate and the diffraction grating; and

coating the diffraction grating with the waveguide film.

29. The microplate of Claim 23, wherein an optical interrogation system is used to interrogate each grating-based waveguide by:

directing a light beam into each grating-based waveguide;

receiving a reflected light beam from each grating-based waveguide; and

analyzing each received reflected light beam to detect a resonant condition which corresponds to a predetermined refractive index that indicates whether the biological substance is present within a sensing region above the waveguide film of the respective grating-based waveguide.